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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

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❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

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2. Title
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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 432)

FEBRUARY 10, 1997

51
LIFE SCIENCES (GENERAL)

19970003413 Atomic Energy Control Board, Ottawa, Ontario Canada

Proceedings of the symposium on molecular biology and radiation protection

Marko, A. M., Atomic Energy Control Board, Canada; Myers, D. K., Atomic Energy Control Board, Canada; Atchison, R. J., Atomic Energy Control Board, Canada; Gentner, N. E., Atomic Energy of Canada Ltd., Canada; Feb. 1996; 67p; In English; Symposium on Molecular Biology and Radiation Protection, 25 Apr. 1995, Ottawa, Canada; Sponsored by Atomic Energy of Canada Ltd., Canada

Report No.(s): INFO-0628; CONF-9504274; DE97-600226; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The symposium on molecular biology and radiation protection was organized in sessions with the following titles: Radiation protection and the human genome; Molecular changes in DNA induced by radiation; Incidence of genetic changes - pre-existing, spontaneous and radiation-induced; Research directions and ethical implications. The ten papers in the symposium have been abstracted individually.

DOE

Deoxyribonucleic Acid; Genetics; Molecular Biology; Radiation Protection

19970003555 Utah Univ., School of Medicine, Radiobiology Div., Salt Lake City, UT USA

Effects of Long-Term Daily Administration of Prostaglandin-E2 on Maintaining Elevated Proximal Tibial Metaphyseal Cancellous Bone Mass in Male Rats

Ke, Hua Zhu, Utah Univ., USA; Jee, Webster S. S., Utah Univ., USA; Mori, Satoshi, Utah Univ., USA; Li, Xiao Jian, Utah Univ., USA; Kimmel, Donald B., Creighton Univ., USA; Calcified Tissue International; 1992; Volume 50, pp. 245-252; In English

Contract(s)/Grant(s): DE-FG02-89ER-60764; DE-AC02-76EV-00119; NAG2-435; NIH-AR-38346

Report No.(s): NASA-CR-202469; NAS 1.26:202469; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

The effects of long-term prostaglandin E(sub 2) (PGE(sub 2)) on cancellous bone in proximal tibial metaphysis were studied in 7 month old male Sprague-Dawley rats given daily subcutaneous injections of 0, 1, 3, and 6 mg PGE(sub 2)/kg/day and sacrificed after 60, 120, and 180 days. Histomorphometric analyses were performed on double fluorescent-labeled undecalcified bone specimens. After 60 days of treatment, PGE(sub 2) produced diffusely labeled trabecular bone area, increased trabecular bone area, eroded and labeled trabecular perimeter, mineral apposition rate, and bone formation rate at all dose levels when compared with age-matched controls. In rats given PGE(sub 2) for longer time periods (120 and 180 days), trabecular bone area, diffusely labeled trabecular bone area, labeled perimeter, mineral apposition, and bone formation rates were sustained at the elevated levels achieved earlier at 60-day treatment. The eroded perimeter continued to increase until 120 days, then plateau. The observation that continuous systemic PGE(sub 2) administration to adult male rats elevated metaphyseal cancellous bone mass to 3.5-fold of the control level within 60 days and maintained it for another 120 days indicates that the powerful skeletal anabolic effects of PGE2 can be sustained with continuous administration .

Author

Prostaglandins; Bones; Bone Mineral Content

19970003681 NASA Ames Research Center, Moffett Field, CA USA

Application of Bacteriorhodopsin Films in an Adaptive-Focusing Schlieren System

Downie, John D., NASA Ames Research Center, USA; Applied Optics; Sep. 10, 1995; ISSN 0003-6935; Volume 34, No. 26, pp. 6021-6027; In English
Contract(s)/Grant(s): RTOP 233-02-05-06
Report No.(s): NASA-TM-111938; NAS 1.15:111938; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The photochromic property of bacteriorhodopsin films is exploited in the application of a focusing schlieren optical system for the visualization of optical phase information. by encoding an image on the film with light of one wavelength and reading out with a different wavelength, the readout beam can effectively see the photographic negative of the original image. The potential advantage of this system over previous focusing schlieren systems is that the updatable nature of the bacteriorhodopsin film allows system adaptation. I discuss two image encoding and readout techniques for the bacteriorhodopsin and use film transmission characteristics to choose the more appropriate method. I demonstrate the system principle with experimental results using argon-ion and He-Cd lasers as the two light sources of different wavelengths, and I discuss current limitations to implementation with a white-light source.

Author

Photochromism; Schlieren Photography; Transparence; Images; Optical Equipment

19970003708 Academy of Sciences (USSR), Zoological Inst., Saint Petersburg, USSR

Russian Insects and Diseases that could Control US Waterweeds ***Final Report, Aug. 1995 - Feb. 1996***

Zaitzev, V. F., Academy of Sciences (USSR), USSR; Volkovitsh, M. G., Academy of Sciences (USSR), USSR; Reznik, S. Ya., Academy of Sciences (USSR), USSR; Podlipaev, S. A., Academy of Sciences (USSR), USSR; Dolgovskaya, M. Yu., Academy of Sciences (USSR), USSR; Feb. 29, 1996; 24p; In English
Contract(s)/Grant(s): N68171-95-C-9121
Report No.(s): AD-A307486; RF959001; R/D-7749-EN-09; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A search for insects and diseases which attack Eurasian watermilfoil (Myriophyllum spicatum L.), waterchestnut (Trapa natans L.) and hydrilla (Hydrilla verticillata Royle) that are the noxious water weeds in the US was made from the literature, taxonomic collections and through consultations with specialists. In total, 32 insect and 7 fungi species associated with the targeted weeds were found on the territory of the former Soviet Union. Most of Insecta are Coleoptera (14 species) and Lepidoptera (7 species). Besides, 5 Diptera, 4 Trichoptera, and 2 Homoptera species were revealed. The majority of the above mentioned insects and all fungi are connected with M. spicatum (28 species). In particular, three weevil species Phytobius leucogaster, Pelenomus canaliculatus and Baqous geniculatus, which are reportedly oligophagous on Myriophyllum spp., may be considered as potential biocontrol agents.

DTIC

Aquatic Plants; Insects; Fungi; Diseases

19970003918

Lipid a: target for antibacterial drugs

Vaara, Martti, Univ of Helsinki, Finland; Science; November 8 1996; ISSN 0036-8075; 274, 5289, pp. 939-940; In English; Copyright; Avail: Issuing Activity

Bacteria are dangerously good at developing resistance to antibiotics. Over the years, a number of antibacterial drugs have been introduced. The most recent of which is a new antibacterial agent aimed at a previously unassaulted part of the bacterial (lipid A of the outer membrane). The efficacy of this new antibacterial agent is currently being verified.

Author (EI)

Antibiotics; Antiinfectives and Antibacterials; Bacteria; Infectious Diseases; Lipids

19970003922

Mg/Ca thermometry in coral skeletons

Mitsuguchi, Takehiro, Nagoya Univ, Japan; Matsumoto, Eiji; Abe, Osamu; Uchida, Tetsuo; Isdale, Peter J.; Science; November 8 1996; ISSN 0036-8075; 274, 5289, pp. 961-963; In English; Copyright; Avail: Issuing Activity

The magnesium-to-calcium (Mg/Ca) ratio of coral skeletons from Ishigaki Island, Ryukyu Islands, Japan, closely tracked sea surface temperature (SST) over an 8-year period. Measurements were made with the fast technique of inductively coupled plasma-atomic emission spectrometry. The variation of the coral Mg/Ca ratio with SST change is about four times that of the current, widely used coral strontium-to-calcium ratio. The temporal and geographic variation of the seawater Mg(2+)//Ca(2+)/ ratio prob-

ably has little influence on coral Mg/Ca variation. Results indicate that the coral Mg/Ca ratio has the potential to provide fast, precise, high-resolution proxies for past tropical SSTs.
Author (EI)
Atmospheric Temperature; Biology; Calcium; Magnesium; Musculoskeletal System; Oxygen Isotopes; Plasmas (Physics); Sea Surface Temperature; Temperature Measurement

19970004041
Crystallogenesis of a human estradiol dehydrogenase-substrate complex
Zhu, DaoWei, Laval Univ, Canada; Azzi, Arezki; Rehse, Peter; Lin, Sheng-Xiang; Journal of Crystal Growth; October 2 1996; ISSN 0022-0248; 168, 1-4, pp. 275-279; In English; Copyright; Avail: Issuing Activity

Human 17 beta -hydroxysteroid dehydrogenase type 1 is an important steroidogenic enzyme catalyzing the synthesis of the most active estrogen: estradiol. The enzyme is formed by two identical subunits (34.5 kDa). In this paper, we report the preparation of a stoichiometric 17 beta -HSD1-estradiol complex sample at a much higher concentration than the solubility of the free substrate, using a gradual concentration of the enzyme-substrate mixture starting at low concentration. The complex is successfully crystallized by vapor diffusion at pH 7.5 with polyethyleneglycol 4000 as the precipitating agent. The space group is C2 with a = 123.56 angstroms, b = 45.21 angstroms, c = 61.30 angstroms and beta = 99.06 deg. There is one monomer in the asymmetric unit and two molecules of the enzyme in a unit cell. A diffraction data set to 2.5 angstroms has been collected to 86% completeness on native crystals. The high quality of the electronic density map of estradiol supports the full occupancy of the binding site, thus confirming the efficiency of the complex preparation. This method will also be useful in crystallizing other steroid-dehydrogenase complexes.
Author (EI)
Catalysis; Crystallization; Enzymes; Glycols; Hormones; Solubility

19970004042
Crystallization and crystallographic studies on Fab fragments of anti-nitrophenol antibodies from primary and secondary immune responses
Mizutani, Ryuta, Univ of Tokyo, Japan; Miura, Keiko; Nakayama, Tomonori; Shimada, Ichio; Arata, Yoji; Satow, Yoshinori; Journal of Crystal Growth; October 2 1996; ISSN 0022-0248; 168, 1-4, pp. 253-259; In English; Copyright; Avail: Issuing Activity

Fab fragments of mouse anti-(4-hydroxy-3-nitrophenyl)acetate (NP) antibodies N1G9 and 3B44 have been crystallized in 6 crystalline forms. Antibody N1G9 is one of the primary immune response antibodies. 3B44 is from the secondary response and exhibits a 10-fold higher affinity than N1G9. Form I crystals of the N1G9 Fab were crystallized using ammonium sulfate as a precipitant, and diffract X-rays to 2.4 angstroms resolution. Crystal forms II, III, IV and V were obtained from polyethylene glycol solutions. They belong to a monoclinic space group and contain two Fab molecules per asymmetric unit. The 3B44 Fab, which has 15 amino-acid mutations from the N1G9 Fab, was crystallized only from a polyethylene glycol solution. The Fab elbow angle in the 3B44 structure from a 2.9 angstroms resolution study on the NP-soaked crystal is 206 deg, larger by 9 deg than that of the N1G9 Fab. Different molecular contacts in the crystal lattices are supposedly originating from this difference in the elbow angles as well as from some of the mutations, and are affecting the crystallization properties of these Fabs.
Author (EI)
Antibodies; Crystal Lattices; Crystallization; Crystallography; Glycols; X Rays

19970004046
2D-crystallization of Rhodococcus 20S proteasome at the liquid-liquid interface
Aoyama, Kazuhiro, Max-Planck-Institut fuer Biochemie, Germany; Journal of Crystal Growth; October 2 1996; ISSN 0022-0248; 168, 1-4, pp. 198-203; In English; Copyright; Avail: Issuing Activity

The 2D-crystallization method using the liquid-liquid interface between a aqueous phase (protein solution) and a thin organic liquid (dehydroabietylamine) layer has been applied to the Rhodococcus 20S proteasome. The 20S proteasome is known to be the core complex of the 26S proteasome, which is the central protease of the ubiquitin-dependent pathway. Two types of ordered arrays were obtained, both large enough for high resolution analysis by electron crystallography. The first one had a four-fold symmetry, whereas the second one was found out to be a hexagonally close-packed array. by image analysis based on a real space correlation averaging (CAV) technique, the close-packed array was found to be hexagonally packed, but the molecules had presumably rotational freedom. The four-fold array was found to be a true crystal with p4 symmetry. Lattice constants were a = b = 20.0 nm and alpha = 90 deg. The unit cell of this crystal contained two molecules. The diffraction pattern computed from the origi-

nal picture showed spots up to (4, 5) that corresponds to 3.1 nm resolution. After applying an unbending procedure, the diffraction pattern showed spots extending to 1.8 nm resolution.
Author (EI)
Crystal Growth; Crystallization; Crystallography; Interfaces; Proteins

19970004047
Cosolute effect on crystallization of two dinucleotide complexes of bovine seminal ribonuclease from concentrated salt solutions
Sica, Filomena, Universita' Federico II di Napoli, Italy; Adinolfi, Salvatore; Vitagliano, Luigi; Zagari, Adriana; Capasso, Sante; Mazzarella, Lelio; Journal of Crystal Growth; October 2 1996; ISSN 0022-0248; 168, 1-4, pp. 192-197; In English; Copyright; Avail: Issuing Activity

Two complexes of bovine seminal ribonuclease with dinucleotides, uridylyl(2' -5')adenosine (UpA) and 2' -deoxycytidylyl(3' -5')-2' -deoxyadenosine (d(CpA)), were crystallized under unusual conditions involving a liquid-liquid phase separation. This phenomenon was induced by adding small aliquots of organic cosolutes to highly concentrated ammonium sulfate solutions. The liquid-liquid interface acts as a source of nucleation centers for growth of large crystals. Among the cosolutes tested in these salt-mediated crystallizations, 2-methyl-2,4-pentanediol was found to be the most efficient.
Author (EI)
Crystal Growth; Crystallization; Enzymes; Interfaces; Phase Separation (Materials)

19970004048
Gel techniques and small angle X-ray scattering to follow protein crystal growth
Bonnete, Francoise, Universites Paris VI et VII, France; Vidal, Olga; Robert, Marie Claire; Tardieu, Annette; Journal of Crystal Growth; October 2 1996; ISSN 0022-0248; 168, 1-4, pp. 185-191; In English; Copyright; Avail: Issuing Activity

Agarose gels have been used in combination with small angle X-ray scattering (SAXS) at the synchrotron radiation facility LURE (Orsay) to follow hen egg white (HEW) lysozyme nucleation and growth. The advantage of using gels rather than solutions is that the nucleation centers, being trapped in the gel network, remain in the X-ray beam during the exposure. The advantage of agarose is that the scattering of the gel alone is limited to the low angle part. Nucleation of lysozyme was induced by decreasing temperature leading to supersaturation in the gel. The effect of varying different parameters was investigated: the percentage of gel and the concentration of salt, the effect of irradiation on crystal growth and the protective effect of an anti-oxidative agent. The crystals formed within one day were good enough to give Bragg reflections at small angles, easily observable with the camera at LURE.
Author (EI)
Bragg Angle; Crystal Growth; Enzymes; Gels; Nucleation; X Ray Scattering

19970004055
Phase diagram of crystallization of Aspergillus niger acid proteinase A, a non-pepsin-type acid proteinase
Kudo, Norio, Univ of Tokyo, Japan; Ataka, Mitsuo; Sasaki, Hiroshi; Muramatsu, Tomonari; Katsura, Tatsuo; Tanokura, Masaru; Journal of Crystal Growth; October 2 1996; ISSN 0022-0248; 168, 1-4, pp. 118-123; In English; Copyright; Avail: Issuing Activity

Proteinase A from Aspergillus niger var. macrosporus is a non-pepsin-type acid proteinase with an extremely low isoelectric point (pI 3.3). The protein is crystallized from ammonium sulfate solutions of pH lower than 4. The crystallization is affected by the presence of dimethylsulfoxide (DMSO). We have studied the phase diagram of the crystallization of proteinase A in the absence and presence of DMSO, to clarify crystallization at such an extremely low pH and to study the effects of DMSO. The results indicate that the logarithm of protein solubility is a rectilinear function of ammonium sulfate concentration in both the absence and presence of DMSO. DMSO definitely lowers the solubility at relatively low concentrations of ammonium sulfate, but had little effect on protein solubility at higher concentrations of ammonium sulfate.
Author (EI)
Crystal Growth; Enzymes; pH; Phase Diagrams

19970004058
Heterogeneity in a protein crystal revealed by synchrotron radiation
Higuchi, Yoshiki, Himeji Inst of Technology, Japan; Okamoto, Takuya; Yasuoka, Noritake; Journal of Crystal Growth; October 2 1996; ISSN 0022-0248; 168, 1-4, pp. 99-105; In English; Copyright; Avail: Issuing Activity

The heterogeneity in a single crystal of hydrogenase has been recognized using synchrotron radiation. This heterogeneity has been estimated from five different positions of the crystal by analyzing the number of significant reflections above background levels and the mosaicity of the diffraction spots. The crystal showed the highest degree of mosaicity at one end of the crystal, the initial point of crystal growth. The degree of mosaicity decreases along the c-axis from the initial point of crystal growth to the opposite end of the crystal. Based on these observations, the relationship between heterogeneity and the process of crystal growth for hydrogenase is discussed.
Author (EI)
Crystal Growth; Enzymes; Single Crystals; Synchrotron Radiation

19970004059
Protein crystal quality studies using rod-shaped crystals
Otalora, Fermin, European Synchrotron Radiation Facility, France; Garcia-Ruiz, Juan M.; Moreno, Abel; Journal of Crystal Growth; October 2 1996; ISSN 0022-0248; 168, 1-4, pp. 93-98; In English; Copyright; Avail: Issuing Activity

Lysozyme single crystals were grown into X-ray capillaries to a size larger than the capillary diameter thus filling it. The two ends of the same crystal grow at different rates, the difference being at least one order of magnitude. These rod-shaped crystals allow ideal diffraction experiments to test crystal quality as a function of the growth rate. In situ X-ray diffraction experiments were carried out using the capillary where the crystal grew. Oscillation pictures yield different values of the maximum resolution level, ranging from 2.5 to 1.2 angstroms for the opposite ends of the crystal suggesting a large influence of growth rate on protein crystal quality.
Author (EI)
Crystallography; Enzymes; Single Crystals

19970004062
Crystallization of biological macromolecules from precipitates: Evidence of Ostwald ripening
Ng, Joseph D., Inst de Biologie Moleculaire et Cellulaire du CNRS, France; Lorber, Bernard; Witz, Jean; Theobald-Dietrich, Anne; Kern, Daniel; Giege, Richard; Journal of Crystal Growth; October 2 1996; ISSN 0022-0248; 168, 1-4, pp. 50-62; In English; Copyright; Avail: Issuing Activity

Crystals were obtained by different methods under conditions where nucleation and growth occur from precipitated macromolecular material. The phenomenon was observed with compounds of different size and nature, such as thaumatin, concanavalin A, an alpha -amylase, a thermostable aspartyl-tRNA synthetase, the nucleo-protein complex between a tRNA(sup Asp) transcript and its cognate yeast aspartyl-tRNA synthetase, and tomato bushy stunt virus. In each system, after a rather rapid precipitation step at high supersaturation lasting one to several days, a few microcrystals appear after prolonged equilibration at constant temperature. With alpha -amylase, the virus and the thermostable synthetase, crystallization is accompanied by appearance of depletion zones around the growing crystals and growth of the largest crystals at the expense of the smaller ones. These features are evidences for crystal growth by Ostwald ripening. In the case of thaumatin, concanavalin A and the nucleo-protein complex, crystallization occurs by a phase transition mechanism since it is never accompanied by the disappearance of the smallest crystals. A careful analysis with thermostable aspartyl-tRNA synthetase indicates that its crystallization at 4 C under high supersaturation starts by a phase transition mechanism with the formation of small crystals within an amorphous protein precipitate. Ostwald ripening follows over a period of up to three/four months with a growth rate of about 0.8 angstrom/s that is 13 times slower than that of crystals growing at 20 C in the absence of precipitate without ripening. At the end of the ripening process at 4 C, only one unique synthetase crystal remains per microassay with dimensions as large as 1 mm.
Author (EI)
Crystal Growth; Crystals; Macromolecules; Nucleation; Ostwald Ripening; Proteins; Ribonucleic Acids

19970004376 Illinois Univ., Champaign, IL USA
(FY 92 AASERT) Augmentation of Research Training in Chronobiology: Regulation of the Mammalian Circadian Clock by Neurotransmitters ***Final Report, 1 Jun. 1993 - 31 May 1996***
Gillette, Martha U., Illinois Univ., USA; Oct. 04, 1996; 8p; In English
Contract(s)/Grant(s): F49620-93-1-0413; AF Proj. 3484
Report No.(s): AD-A316454; AFOSR-TR-96-0515; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Seven young scientists benefited from research training in our lab due to this AFOSR-sponsored AASERT. Each made significant contribution to our overall research aim to elucidate the cellular organizat ion and regulation of the brain's biological clock. This structure controls daily (circadian) rhythms of behavior (e.g., performance), physiology and metabolism in mammals. The

clock, located in the suprachiasmatic nucleus (SCN), survived for up to 4 days in a hypothalamic brain slice where its properties were directly probed. by applying this technique to SCN from inbred rats, trainees made progress in demonstrating that: (1) glutamate and nitric oxide mediate light-induced phase-resetting of the clock at night, but not day; (2) nocturnal activation of this pathway leads to phosphorylation of the transactivational site on nuclear Ca+2/cAMP response element binding protein (CREB); (3) glutamic acid decarboxylase (GAD), the biosynthetic enzyme for GABA, oscillates; (4) NPY can modulate serotonergic phase-shifts in daytime; (5) SCN neuronal activity rhythms can be monitored continuously by a carbon fiber bundle electrode; (6) neuronal nitric oxide synthase.(nNOS) is the dominant SCN isoform. This project involved both individual and interactive research projects at the University of Illinois and the USAF School for Aerospace Medicine.
DTIC
Neurotransmitters; Circadian Rhythms; Mammals; Augmentation; Rhythm (Biology); Nocturnal Variations; Neurophysiology; Hypothalamus; Glutamic Acid

19970004565 Armed Forces Radiobiology Research Inst., Bethesda, MD USA
Neutron and Gamma-Ray Radiation Killing of Bacillus Species Spores: Dosimetry, Quantitation, and Validation Techniques
Ledney, G. D., Armed Forces Radiobiology Research Inst., USA; Knudson, G. B., Armed Forces Radiobiology Research Inst., USA; Harding, R. A., Armed Forces Radiobiology Research Inst., USA; Bhatt, R. C., Armed Forces Radiobiology Research Inst., USA; Kearsley, E. E., Armed Forces Radiobiology Research Inst., USA; Zmuda, J. A., Armed Forces Radiobiology Research Inst., USA; Apr. 1996; 27p; In English
Contract(s)/Grant(s): MIPR94-551
Report No.(s): AD-A307995; AFRRI-TR-96-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The validation of sterilization processes is currently monitored by qualitative estimates of bacterial spores using inactivation of commercially available spore-impregnated cellulose fiber strips where sterility is determined by the presence or absence of growth in an appropriate medium. Using the standardized technique in the U.S. Pharmacopeia (USP) National Formulary 22, spore kill is quantified by pulping multiple spore strips in a large volume of diluent. Such tests do not allow quantitative analysis of killing on each separate strip. In this study, the standard USP test was modified to quantify sterilization of spores on single cellulose fiber strips that were irradiated with fission neutrons produced by a TRIGA reactor and by Co-60 gamma-rays. The technique, developed at the Armed Forces Radiobiology Research Institute (AFRRI), was validated for similarly treated spore strips by comparing data obtained from an independent commercial laboratory and certificated values provided by the supplier of the spore strips. The number of Bacillus subtilis and Bacillus pumilus spores identified by the two laboratories were similar for controls (unirradiated spore strips) and for spore strips that received selected doses of fission neutrons or gamma-rays. It was thus concluded that assay techniques, developed and used at A FFRI to enumerate spore survival, accurately quantify spore kill after neutron and gamma-irradiation. These techniques can be used in more extensive studies to determine the killing effect for spores irradiated under a variety of environmental conditions.
DTIC
Neutron Irradiation; Bacillus; Spores; Sterilization; Cobalt 60; Gamma Rays; Radiobiology; Quantitative Analysis; Bacteria

19970004571 Tennessee Univ., Center for Environmental Biotechnology., Knoxville, TN USA
Molecular Probes and Bioluminescent Reporters in Ecological Optimization of Biodegradation ***Final Report, 1 Jun. 1992 - 31 May 1995***
Sayler, G. S., Tennessee Univ., USA; May 31, 1995; 4p; In English
Contract(s)/Grant(s): F49620-92-J-0333; AF Proj. 3484
Report No.(s): AD-A307406; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

DNA probe and bioluminescent sensor technology is being used to assess the bio-availability of sorbed or immiscible-phase toluene and polycyclic aromatic hydro-carbons (PAR) in particulate media. Construction of improved bioluminescent reporter strains for PAH and toluene (also trichloroethylene) degradation is ongoing. For PAR degradation, the approach involves incorporation of a transposon containing the lower naphthalene pathway promoter fused to the lux genes (nah-lux) into the bacterial chromosome. One of the two transposons (Tn5-based transposon) appears to be successful in forming the fusion product and incorporating into the Psuedomonas genomes. Work is ongoing. For toluene biodegradation, the approach involves a bacterial strain containing a plasmid-encoded tod-lux gene fusion. The strain produces light when the inducer, toluene, signals an increased production of the catabolizing enzyme, toluene diooxygenase. Finally, a related project involves the development of a combined

method to extract and analyze both DNA and lipids from the same environmental sample in order to maximize the informational content of a single sample with respect to biomass content, community structure and the physiological status of microorganisms. DTIC

Bioluminescence; Biodegradation; Deoxyribonucleic Acid; Polycyclic Aromatic Hydrocarbons; Toluene; Bacteria

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19970003544 NASA, Moffett Field, CA USA

Serial Scanning and Registration of High Resolution Quantitative Computed Tomography Volume Scans for the Determination of Local Bone Density Changes ***Final Report***

Whalen, Robert T., NASA, USA; Napel, Sandy, Stanford Univ., USA; Yan, Chye H., Stanford Univ., USA; Nov. 01, 1996; 26p; In English

Contract(s)/Grant(s): NCC2-5088

Report No.(s): NASA-CR-202722; NAS 1.26:202722; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Progress in development of the methods required to study bone remodeling as a function of time is reported. The following topics are presented: 'A New Methodology for Registration Accuracy Evaluation', 'Registration of Serial Skeletal Images for Accurately Measuring Changes in Bone Density', and 'Precise and Accurate Gold Standard for Multimodality and Serial Registration Method Evaluations.'

Derived from text

Bones; Musculoskeletal System; Algorithms; Imaging Techniques; Nonintrusive Measurement; Image Enhancement; Tomography

19970003759 NASA Ames Research Center, Moffett Field, CA USA

Simulated Microgravity Increases Cutaneous Blood Flow in the Head and Leg of Humans

Stout, M. Shannon, NASA Ames Research Center, USA; Watenpaugh, Donald E., NASA Ames Research Center, USA; Breit, Gregory A., NASA Ames Research Center, USA; Hargens, Alan R., NASA Ames Research Center, USA; Aviation, Space, and Environmental Medicine; Sep. 1995; Volume 66, No. 9, pp. 872-875; In English

Contract(s)/Grant(s): RTOP 199-14-12-04

Report No.(s): NASA-TM-111941; NAS 1.15:111941; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The cutaneous microcirculation vasodilates during acute 6 degree head-down tilt (HDT, simulated microgravity) relative to upright conditions, more in the lower body than in the upper body. Cutaneous microvascular blood flow was measured with laser-Doppler flowmetry at the leg (over the distal tibia) and cheek (over the zygomatic arch) of eight healthy men before, during, and after 24 h of HDT. Results were calculated as a percentage of baseline value (100% measured during pre-tilt upright sitting). Cutaneous blood flow in the cheek increased significantly to 165 +/- 37% (mean +/- SE, p less than 0.05) at 9-12 h HDT, then returned to near baseline values by 24 h HDT (114 +/- 29%, NSD), despite increased local arterial pressure. Microvascular flow in the leg remained significantly elevated above baseline througout 24 h HDT (427 +/- 85% at 3 h HDT and 215 +/- 142% at 24 h HDT, p less than 0.05). During the 6-h upright sitting recovery period, cheek and leg blood flow levels returned to near pre-tilt baseline values. Because hydrostatic effects of HDT increase local arterial pressure at the carotid sinus, baroreflex-mediated withdrawal of sympathetic tone probably contributed to increased microvascular flows at the head and leg during HDT. In the leg baroreflex effects combined with minimal stimulation of local veno-arteriolar and myogenic autoregulatory vasoconstriction to elicit relatively larger and more sustained increases in cutaneous flow during HDT. In the cheek, delayed myogenic vasoconstriction and/or hurmonal effects apparently compensated for flow elevation by 24 h of HDT. Therefore, localized vascular adaptations to gravity probably explain differences in acclimation of lower and upper body blood flow to HDT and actual microgravity.

Author (revised)

Microgravity; Blood Flow; Physiological Responses; Gravitational Effects; Gravitational Physiology; Head Down Tilt; Vasodilation; Weightlessness

19970003926

Distinct mechanisms for synchronization and temporal patterning of odor-encoding neural assemblies

Macleod, Katrina, California Inst of Technology, USA; Laurent, Gilles; Science; November 8 1996; ISSN 0036-8075; 274, 5289, pp. 976-979; In English; Copyright; Avail: Issuing Activity

Stimulus-evoked oscillatory synchronization of neural assemblies and temporal patterns of neuronal activity have been observed in many sensory systems, such as the visual and auditory cortices of mammals or the olfactory system of insects. In the locust olfactory system, single odor puffs cause the immediate formation of odor-specific neural assemblies, defined both by their transient synchronized firing and their progressive transformation over the course of a response. The application of an antagonist of ionotropic gamma -aminobutyric acid (GABA) receptors to the first olfactory relay neuropil selectively blocked the fast inhibitory synapse between local and projection neurons. This manipulation abolished the synchronization of the odor-coding neural ensembles but did not affect each neuron's temporal response patterns to odors, even when these patterns contained periods of inhibition. Fast GABA-mediated inhibition, therefore, appears to underlie neuronal synchronization but not response tuning in this olfactory system. The selective desynchronization of stimulus-evoked oscillating neural assemblies in vivo is now possible, enabling direct functional tests of their significance for sensation and perception.
Author (EI)
Butyric Acid; Neurology; Odors; Synchronism

19970004236 Technische Hochschule, Dept. of Neurology, Aachen, Germany
Effects of Sustained Low-Level Elevations of Carbon Dioxide on Cerebral Blood Flow and Autoregulation of the Intracerebral Arteries in Humans ***Final Report***
Sliwka, U., Technische Hochschule, Germany; Krasney, J. A., Buffalo Univ., USA; Simon, S. G., Technische Hochschule, Germany; Schmidt, P., Technische Hochschule, Germany; 1996; 34p; In English
Contract(s)/Grant(s): NAG2-9417; 95-CO2-02D
Report No.(s): NASA-CR-203033; NAS 1.26:203033; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cerebral blood flow velocity (CBFv) was measured by insonating the middle cerebral arteries of 4 subjects using a 2 Mhz transcranial Doppler. Ambient CO2 was elevated to 0.7% for 23 days in the first study and to 1.2% for 23 days in the same subjects in the second study. by non-parametric testing CBFv was elevated significantly by +35% above pre-exposure levels during the first 1-3 days at both exposure levels after which CBFv progressively readjusted to pre-exposure levels. Despite similar CBFv responses, headache was only reported during the initial phase of exposure to 1.2% CO2. Vascular reactivity to CO2 assessed by rebreathing showed a similar pattern with the CBFv increases early in the exposures being greater than those elicited later. An increase in metabolic rate of the visual cortex was evoked by having the subjects open and close their eyes during a visual stimulus. Evoked CBFv responses measured in the posterior cerebral artery were also elevated in the first 1-3 days of both studies returning to pre-exposure levels as hypercapnia continued. Cerebral vascular autoregulation assessed by raising head pressure during 10 deg head-down tilt both during the low-level exposures and during rebreathing was unaltered. There were no changes in the retinal microcirculation during serial fundoscopy studies. The time-dependent changes in CO2 vascular reactivity might be due either to retention of bicarbonate in brain extracellular fluid or to progressive increases in ventilation, or both. Cerebral vascular autoregulation appears preserved during chronic exposure to these levels of ambient CO2.
Author
Blood Flow; Carbon Dioxide; Flow Velocity; Arteries; Physiological Responses; Metabolism; Head Down Tilt; Cerebrum; Hypercapnia; Microgravity; Physiological Tests

19970004243 NASA Ames Research Center, Moffett Field, CA USA
Pharmacologic Atrial Natriuretic Peptide Reduces Human Leg Capillary Filtration
Watenpaugh, Donald E., NASA Ames Research Center, USA; Vissing, SUSAnne F., Texas Univ., USA; Lane, Lynda D., Texas Univ., USA; Buckey, Jay C., Texas Univ., USA; Firth, Brian G., Texas Univ., USA; Erdman, William, Texas Univ., USA; Hargens, Alan R., Texas Univ., USA; Blomqvist, C. Gunnar, Texas Univ., USA; Journal of Cardiovascular Pharmacology; 1995; Volume 26, No. 3, pp. 414-419; In English
Contract(s)/Grant(s): NAG9-267; NGT-50206; NAG9-16044; DMRC-12-6945; DMRC-12-7663
Report No.(s): NASA-CR-202706; NAS 1.26:202706; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

Atrial natriuretic peptide (ANP) is produced and secreted by atrial cells. We measured calf capillary filtration rate with prolonged venous-occlusion plethysmography of supine healthy male subjects during pharmacologic infusion of ANP (48 pmol/kg/min for 15 min; n = 6) and during placebo infusion (n = 7). Results during infusions were compared to prior control measurements. ANP infusion increased plasma (ANP) from 30 +/- 4 to 2,568 +/- 595 pmol/L. Systemic hemoconcentration occurred during ANP infusion: mean hematocrit and plasma colloid osmotic pressure increased 4.6 and 11.3%, respectively, relative to preinfusion baseline values (p less than 0.05). Mean calf filtration, however, was significantly reduced from 0.15 to 0.08 ml/100 ml/min with ANP. Heart rate increased 20% with ANP infusion, whereas blood pressure was unchanged. Calf conductance (blood flow/ arterial pressure) and venous compliance were unaffected by ANP infusion. Placebo infusion had no effect relative to prior baseline control

measurements. Although ANP induced systemic capillary filtration, in the calf, filtration was reduced with ANP. Therefore, pharmacologic ANP infusion enhances capillary filtration from the systemic circulation, perhaps at upper body or splanchnic sites or both, while having the opposite effect in the leg.
Author
Arteries; Peptides; Capillaries (Anatomy); Blood Pressure; Heart Rate; Physiological Responses; Leg (Anatomy)

19970004288 Pennsylvania State Univ., Dept. of Chemistry, University Park, PA USA
Electrochemistry In and At Single Nerve Cells ***Final Report***
Ewing, Andrew G., Pennsylvania State Univ., USA; 1 Sep. 1996; 7p; In English
Contract(s)/Grant(s): N00014-90-J-1161; ONR 96PRO-3596
Report No.(s): AD-A313930; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Partial contents: Dopamine Exocytosis from the Neuronal Cell Body Induced by and Increase in Intracellular Sodium Concentration; Electrochemical Analysis in Picoliter Microvials; Identification of Multiple Compartments of Dopamine in a Single Cell by Capillary Electrophoresis with Scanning Electrochemical Detection; Vesicular Dopamine Levels of Two Classes of Vesicles Are Differentially Depleted by Amphetamine; Characterization of the Effects of Varying the pll and Monomer Concentrations of Poly(oxyphenylene) Insulating Films on Carbon Fiber Electrodes; Chemical Analysis of Single Cells, Critical Reviews in Neurobiology; Electrochemical Monitoring of Bursting Exocytotic Events from the Oiant Dopamine Neuron of Planorbis corneus; Observation and Quantitation of Exocytosis from the Cell Body of a Fully Developed Neuron in Planorbis corneus; Multiple Classes of Cateeholamine Vesicles Observed During Exocytosis from the Planorbis Cell Body; The Latency of Exocytosis Varies with the Mechanism of Stimulated Release in PC12 Cells; Vesicular Quantal Size Measured by Amperometry at Chromaffin; Mast; Pheochromoeytoma, and Pancreatic-Cells; Electrochemical Monitoring of Individual Exocytotic Events from the Varicosities of Differentiated PCl2 Cells.
DTIC
Nervous System; Cells (Biology); Electrochemistry; Electrophoresis

19970004380 BDM Federal, Inc., Seaside, CA USA
Task Analysis for Provide Decontamination (Critical Combat Function 27) As Accomplished by a Battalion Task Force ***Interim Report, 17 Jul. 1992 - 15 Mar. 1996***
Flanigan, Desmond W., BDM Federal, Inc., USA; Aug. 1996; 79p; In English
Contract(s)/Grant(s): MDA903-92-D-0075-0005
Report No.(s): AD-A313983; ARI-CR-96-45; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The purpose of CCF 27 is TF personnel, equipment and supplies, as well as, working areas needed to accomplish the mission are made safe. The TF is fully prepared for the tactical mission and can readily conduct decontamination activities without degrading its ability to accomplish the mission. The outcomes include: (1) Individual soldiers/operators perform basic decontamination to standard - skin decontamination, personal wipedown, operators spray down; (2) Unit performs hasty decontamination to standard - MOOP gear exchange, vehicle washdown, site cleanup, site marking, report decon status; (3) Unit performs deliberate decontamination to standard - coordination for decontamination, detailed soldier decontamination, site cleanup, report decon status; and (4) Contaminated units are restored to full combat potential with minimum delay.
DTIC
Contamination; Decontamination; Chemical Warfare

19970004544 NASA Ames Research Center, Moffett Field, CA USA
Effects of Optical Pitch on Oculomotor Control and the Perception of Target Elevation
Cohen, Malcolm M., NASA Ames Research Center, USA; Ebenholtz, Sheldon M., State Univ. of New York, USA; Linder, Barry J., Permanente Medical Group, USA; Perception and Psychophysics; 1995; Volume 57, No. 4, pp. 433-440; In English
Contract(s)/Grant(s): RTOP 199-16-12-08
Report No.(s): NASA-TM-111937; NAS 1.15:111937; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

In two experiments, we used an ISCAN infrared video system to examine the influence of a pitched visual array on gaze elevation and on judgments of visually perceived eye level. In Experiment 1, subjects attempted to direct their gaze to a relaxed or to a horizontal orientation while they were seated in a room whose walls were pitched at various angles with respect to gravity. Gaze elevation was biased in the direction in which the room was pitched. In Experiment 2, subjects looked into a small box that was pitched at various angles while they attempted simply to direct their gaze alone, or to direct their gaze and place a visual target at their apparent horizon. Both gaze elevation and target settings varied systematically with the pitch orientation of the box. Our

results suggest that under these conditions, an optostatic response, of which the subject is unaware, is responsible for the changes in both gaze elevation and judgments of target elevation.
Author
Eye (Anatomy); Physiological Responses; Relaxation (Physiology); Horizontal Orientation; Elevation

19970004550 Defence Research Establishment Suffield, Ralston, Alberta Canada
Development of a Microplate Gene Probe Assay for Newcastle Disease Virus
Bader, Douglas E., Defence Research Establishment Suffield, Canada; Lewis, Jane, Defence Research Establishment Suffield, Canada; Oct. 1995; 37p; In English
Report No.(s): AD-A307318; DRES-SM-1470; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A microplate gene probe assay for Newcastle disease virus was developed to take advantage of enhancements in automation and machine-readable quantitation over membrane-based assay formats. A 673 base pair double-stranded DNA fragment of the major nucleocapsid protein gene of Newcastle disease virus was labelled with a non-radioactive molecule (digoxigenin) and used as a probe against denatured, unlabelled DNA bound to 96-well, polystyrene microtiter plates. The probe/target complex was detected with an anti-digoxigenin antibody conjugated to horseradish peroxidase, followed by colorimetric detection at 405 nm. Technical details in the development and optimization of the microplate assay are presented. The optimized assay had a lower detection limit of about 2x107 molecules of DNA under low stringency conditions (Tm-320C). A membrane-based gene probe assay developed for the same probe/target, showed a lower detection limit of 1O5-1O6 molecules under high stringency conditions (Tm-1.4 C) indicating that the microplate assay was not as sensitive. Even though the microplate assay was found to be less sensitive relative to the membrane assay, other characteristics such as enhanced capability for automation (plate washing and reading), machine-readable quantitation (simpler, relatively lower cost) and ease of handling and manipulation were realized, favouring the microplate format as an option for fieldable identification systems such as those sent to the Gulf War during Operation Desert Storm.
DTIC
Deoxyribonucleic Acid; Diseases; Viruses; Military Operations

19970004559 Defence Research Establishment Suffield, Ralston, Alberta Canada
Gene Probe Assay of Viral Nucleic Acid Using a Silicon Biosensor
Bader, Douglas E., Defence Research Establishment Suffield, Canada; Fisher, Glen R., Defence Research Establishment Suffield, Canada; Lee, William E., Defence Research Establishment Suffield, Canada; Jan. 1996; 28p; In English
Report No.(s): AD-A307320; DRES-SM-1471; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The use ot a silicon-based biosensor for a gene probe assay is described. The target analyte, a 391 base pair DNA fragment, was mixed with a pair of probes, one labelled with biotin, the other with fluorescein, and hybridized in homogeneous solution phase. The hybridized product was separated by biotin-streptavidin mediated filtration capture and detected using a light-addressable potentiometric sensor which monitored the presence of urease conjugated (anti-fluorescein) antibodies incorporated in the hybridized product. The total assay time, including hybridization, filtration capture and potentiometric sensing was 45-60 min. The lower detection limit for the assay was 0.3 fmole (1.8 x 108 molecules) of single-stranded target DNA under low stringency conditions (Tm-22 C). The results indicate that the LAPS assay generates detection limits similar to conventional membrane-based colorimetric assays but in much less time. The LAPS assay is also less technically demanding.
DTIC
Deoxyribonucleic Acid; Detection; Fluorescence; Time Dependence; Analyzers; Constraints

19970004560 Defence Research Establishment Suffield, Ralston, Alberta Canada
Evaluation of a Sandwich Gene Probe Assay for Newcastle Disease Virus
Bader, Douglas E., Defence Research Establishment Suffield, Canada; Gray, Darrin, Defence Research Establishment Suffield, Canada; Feb. 1996; 27p; In English
Report No.(s): AD-A307319; SM-1474; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A sandwich gene probe assay was evaluated in comparison to a direct gene probe assay. The target sequence used in each of the assays was a 673 bp DNA fragment of the major nucleocapsid protein gene of Newcastle Disease Virus (NDV). In the direct probe assay, the 673 bp DNA fragment was labelled with digoxigenin and hybridized to unlabelled 673 bp target DNA. In the sandwich assay, the target DNA was detected using two probes. The primary probe was unlabelled, recombinant M13mp18 viral DNA containing the 673 bp gene fragment which hybridized to the 673 bp target DNA. The secondary probe was digoxigenin-labelled M13mp18 DNA which hybridized to the M13 sequences within the primary probe. The sandwich assay resulted in detection limits similar to those demonstrated for the direct assay (1O% molecules of purified target DNA) when molar probe con-

centrations for the two as says were around 20 pM. When molar probe concentrations in the sandwich assay were increased beyond this, sensitivity decreased and background problems due to non-specific binding became evident. Based on these results, the direct assay is the method of choice since the sandwich assay was no more sensitive than the direct assay, required more probe material and required additional time-consuming probe preparation steps.
DTIC
Deoxyribonucleic Acid; Diseases; Viruses

19970004572 Defence Research Establishment Suffield, Ralston, Alberta Canada
Construction of a Recombinant Viral Vector Containing Part of the Nucleocapsid Protein Gene of Newcastle Disease Virus
Bader, Douglas E., Defence Research Establishment Suffield, Canada; Sep. 1995; 36p; In English
Report No.(s): AD-A307322; DRES-SM-1464; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes the procedures used to clone a 673 base pair gene fragment of the major nucleocapsid protein gene of Newcastle disease virus into a viral vector molecule for the purpose of maintaining a stable, long-term, renewable source of this target sequence for gene probe studies. The gene fragment was prepared by reverse-transcription polymerase chain reaction of Newcastle disease virus RNA and was cloned into the viral DNA vector Ml3mp18 RF to produce a recombinant DNA molecule. The cloned fragment was shown to be present in the recombinant clones based on: (1) clonal selection on indicator plates; (2) restriction enzyme analysis; (3) gene probe analysis; and (4) nested PCR amplification.
DTIC
Deoxyribonucleic Acid; Pair Production; Ribonucleic Acids; Molecular Chains; Viruses; Diseases

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

19970003664 Educational Testing Service, Princeton, NJ USA
Missing Responses and IRT Ability Estimation: Omits, Choice, Time Limits, and Adaptive Testing ***Final Report***
Misley, Robert J., Educational Testing Service, USA; Wu, Pao-Kuei, Educational Testing Service, USA; Jun. 1996; 57p; In English
Contract(s)/Grant(s): N00014-91-J-4101; RR04204
Report No.(s): AD-A313823; ETS-RR-96-30-ONR; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The basic equations of Item Response Theory (IRT) provide a foundation for inferring examinees abilities from responses to different test items. In practice, examinees do not generally provide a response to all items-for reasons that may or may not have been intended by the test administrator, and that may or may not be related to their ability. The mechanisms that produce missingness must be taken into account if correct inferences are to be drawn. Using concepts introduced by Rubin (1976), we discuss the implications for Bayesian and direct likelihood ability parameter estimation that are entailed by alternate test forms, targeted testing, adaptive testing, time limits, omitted responses, and examinee choice of tasks. Attention is focused on whether, in each case, the mechanism for missingness is 'ignorable,' and, in those cases in which it is not, how it can be modeled.
DTIC
Estimating; Statistical Analysis; Mathematical Models

19970003668 Northwestern Univ., Inst. for the Learning Sciences, Evanston, IL USA
Reasoning-Congruent Learning Environments: Scaffolding Learning by Doing in New Domains ***Interim Report, Aug. 1992 - Mar. 1994***
Merrill, Douglass C., Northwestern Univ., USA; Reiser, Brian, Northwestern Univ., USA; Apr. 1996; 32p; In English
Contract(s)/Grant(s): MDA903-92-C-0114
Report No.(s): AD-A313024; ARI-RN-96-60; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

One major focus of research in cognitive science and education has been the mental representation of problem solving knowledge. Novices facing problems in new domains need to reason about the causes and effects of domain operators to be able to learn from problem solving in the new domain. We argue that this caUSAl reasoning allows novices to apply their learning to new situations. We will first highlight some difficulties facing novices in new domains, and propose a theory of learning environment design emphasizes the role of the problem solving environment as a structured note pad to support incremental planning and execution

of problem solutions. We will describe three groups of actions that such an environment must lead students to perform and the outcomes of these actions for novices.
DTIC
Learning; Problem Solving; Cognition; Mental Performance

19970003771 Central State Univ., Wilberforce, OH USA
The Effects of System Failure and Time Limitations on Problem-Solving Behavior and Performance ***Final Report, Jun. 1990 - Dec. 1993***
Walker, Bonnie J., Central State Univ., USA; Mar. 1996; 79p; In English
Contract(s)/Grant(s): MDA903-90-C-0104
Report No.(s): AD-A313208; ARI-RN-96-46; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
To explore the effects of system failure (data error) and time limitations on problem-solving behavior and performance, 12 experiments were conducted using two inferential reasoning tasks. In general, system failure and time limitations lead to significant decrements in performance. In addition, a protocol analysis of problem-solving behavior revealed under both normal and system failure was indicative of a lack of development of metacognitive strategies for working under unreliable conditions. It was recommended that system training under degraded modes of operation should include some provisions for imposing time limits for the completion of certain tasks.
DTIC
Human Performance; System Failures; Problem Solving; Complex Systems; Time Dependence

19970003802 Carnegie-Mellon Univ., Pittsburgh, PA USA
Novice Strategies for Comprehending Technical Texts ***Final Report***
Dee-Lucas, Diana, Carnegie-Mellon Univ., USA; Larkin, Jill H., Carnegie-Mellon Univ., USA; Apr. 1996; 109p; In English
Contract(s)/Grant(s): MDA903-85-K-0180
Report No.(s): AD-A313179; ARI-RN-96-61; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This project investigated the comprehension of technical texts by novice readers (i.e., people who are not familiar with technical subject matter). It focused on two questions: (1) how do novice readers determine what is important in technical texts, and (2) how does the organization of information in technical domains influence novice text processing and learning.
DTIC
Texts; Image Processing

19970003833 Navy Personnel Research and Development Center, San Diego, CA USA
The Interactive Multisensor Analysis Training System: Using Scientific Visualization Technology to Teach Complex Cognitive Skills ***Final Report***
Wetzel-Smith, Sandra K., Navy Personnel Research and Development Center, USA; Czech, Carl, Navy Personnel Research and Development Center, USA; Aug. 1996; 19p; In English
Report No.(s): AD-A313318; NPRDC-TR-96-9; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Successful operation of airborne weapons and sensor systems demands that operators and tacticians possess high-level understanding of how environments and potential targets interact so they may best configure onboard suites. The complex cognitive skills required can only be the product of appropriately designed training, especially when opportunities for practice are limited. The Interactive Multisensor Analysis Training (IMAT) System uses advanced scientific visualization technology to conceptually present the interactions among sensors, and environments in realistic mission scenarios. Using approved Navy, Department of Defense, and other suitable databases (e.g. DBDB-5, ANDES), IMAT computers and display systems transform the data into understandable graphic formats. As support for cognitive skill oriented training programs, IMAT has provoked a new approach to instructional design. The IMAT approach promises to increase training efficiency and effectiveness in complex warfare areas such as anti-submarine, electronic, and mine countermeasures by accelerating the development of domain expertise and improving trainee performance during training. IMAT may also be appropriately applied to other complex cognitive skill domains inside and outside the Department of Defense, including technical training and education in meteorology, oceanography, geology, ecology, and disaster preparedness.
DTIC
Computer Assisted Instruction; Multisensor Applications; Cognition; Training Devices; Electronic Countermeasures

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19970003569 Navy Experimental Diving Unit, Panama City, FL USA
Evaluation of the Poseidon Odin Scuba Regulator for Use In Cold Water, *Jan. 1994 - Dec. 1995*
Clarke, J. R., Navy Experimental Diving Unit, USA; Rainone, M., Navy Experimental Diving Unit, USA; Dec. 1995; 19p; In English
Report No.(s): AD-A313945; NEDU-TR-14-95; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Navy Experimental Diving Unit (NEDU) tested the breathing effort and susceptibility to freeze-up of the Poseidon Odin Jetstream SCUBA regulator. The regulator was tested in 28 F (-2 C) salt water, at depths to 198 fsw (60.7 msw). Five samples of the model were tested. The probability of regulator failure was computed from the number of cold induced incidents, and the time to failure for each incident. Under these rigorous conditions, the probability of failure for the Poseidon Odin was very low (Pf = 0.074). There were also no high breathing pressure incidents during the resistive effort measurements with a 1500 psi supply pressure, even at RMVs up to 90 L/min. The Poseidon Odin is recommended for use in sea water at 28 F and depths to 190 fsw. DTIC
Cold Water; Breathing Apparatus; Diving (Underwater)

19970004207 NASA Ames Research Center, Moffett Field, CA USA
Incineration as a Method for Resource Recovery from Inedible Biomass in a Controlled Ecological Life Support System
Bubenheim, David L., NASA Ames Research Center, USA; Wignarajah, Kanapathipillai, Bionetics Corp., USA; Life Supp. and Biosph. Sci.; 1995; ISSN 1069-9422; Volume 1, pp. 129-140; In English
Contract(s)/Grant(s): RTOP 199-61-12-28
Report No.(s): NASA-TM-111943; NAS 1.15:111943; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Resource recovery from waste streams in a space habitat is essential to minimize the resupply burden and achieve self-sufficiency. In a Controlled Ecological Life Support System (CELSS) human wastes and inedible biomass will represent significant sources of secondary raw materials necessary for support of crop plant production (carbon, water, and inorganic plant nutrients). Incineration, pyrolysis, and water extraction have been investigated as candidate processes for recovery of these important resources from inedible biomass in a CELSS. During incineration CO2 is produced by oxidation of the organic components and this product can be directly utilized by plants. Water is concomitantly produced, requiring only a phase change for recovery. Recovery of inorganics is more difficult, requiring solubilization of the incinerator ash. The process of incineration followed by water solubilization of ash resulted in loss of 35% of the inorganics originally present in the biomass. Losses were attributed to volatilization (8%) and non-water-soluble ash (27%). All of the ash remaining following incineration could be solubilized with acid, with losses resulting from volatilization only. The recovery for individual elements varied. Elemental retention in the ash ranged from 100% of that present in the biomass for Ca, P, Mg, Na, and Si to 10% for Zn. The greatest water solubility was observed for potassium with recovery of approximately 77% of that present in the straw. Potassium represented 80% of the inorganic constituents in the wheat straw, and because of slightly greater solubility made up 86% of the water-soluble ash. Following incineration of inedible biomass from wheat, 65% of the inorganics originally present in the straw were recovered by water solubilization and 92% recovered by acid solubilization. Recovery of resources is more complex for pyrolysis and water extraction. Recovery of carbon, a resource of greater mass than the inorganic component of biomass, is more difficult following pyrolysis and water extraction of biomass. In both cases, additional processors would be required to provide products equivalent to those resulting from incineration alone. The carbon, water, and organic resources of inedible biomass are effectively separated and output in USAble forms through incineration.
Author
Closed Ecological Systems; Incinerators; Biomass; Pyrolysis; Oxidation; Wheat; Thermogravimetry

19970004245 NASA Johnson Space Center, Houston, TX USA
The Evolution of the Posture Video Analysis Tool(trademark) (PVAT)
Whitmore, Mihriban, Lockheed Martin Engineering and Science Services, USA; Berman, Andrea H., Lockheed Martin Engineering and Science Services, USA; Nov. 1996; 30p; In English
Report No.(s): NASA-TP-3657; S-818; NAS 1.60:3657; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Posture Video Analysis Tool(trademark) (PVAT) has been developed by the Human Factors and Ergonomics Laboratory (HFEL) engineers at the NASA Johnson Space Center in response to the need for a low cost, reliable method of collecting postural data from nonscientific mission video footage. The PVAT is an interactive Macintosh menu and button driven SuperCard(registered mark) prototype consisting of a setup and an analysis screen. Since its creation, PVAT has undergone a series of USAbility evaluations The testing accomplished thus far has assisted the PVAT designers in improving the interface with both subtle and sweeping changes. The results of these iterative evaluations demonstrated that the PVAT is a promising initial step in identifying and quantifying 'limiting microgravity postures' and related workstation design concerns. Furthermore, it is also anticipated that the PVAT will be applicable in a host of nonaerospace industries with little or no modification. If funding is available, further evaluations will be conducted to refine its graphical user interface and demonstrate its industrial applications.
Author
Human Factors Engineering; Microgravity; Posture; Human-Computer Interface

Subject Term Index

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Report Documentation Page

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16. Abstract

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